THE 'UNUSUAL' EVOLUTION OF HURRICANE ARTHUR 2014:

GOES-R AND JPSS SATELLITE PROVING GROUND PERSPECTIVE

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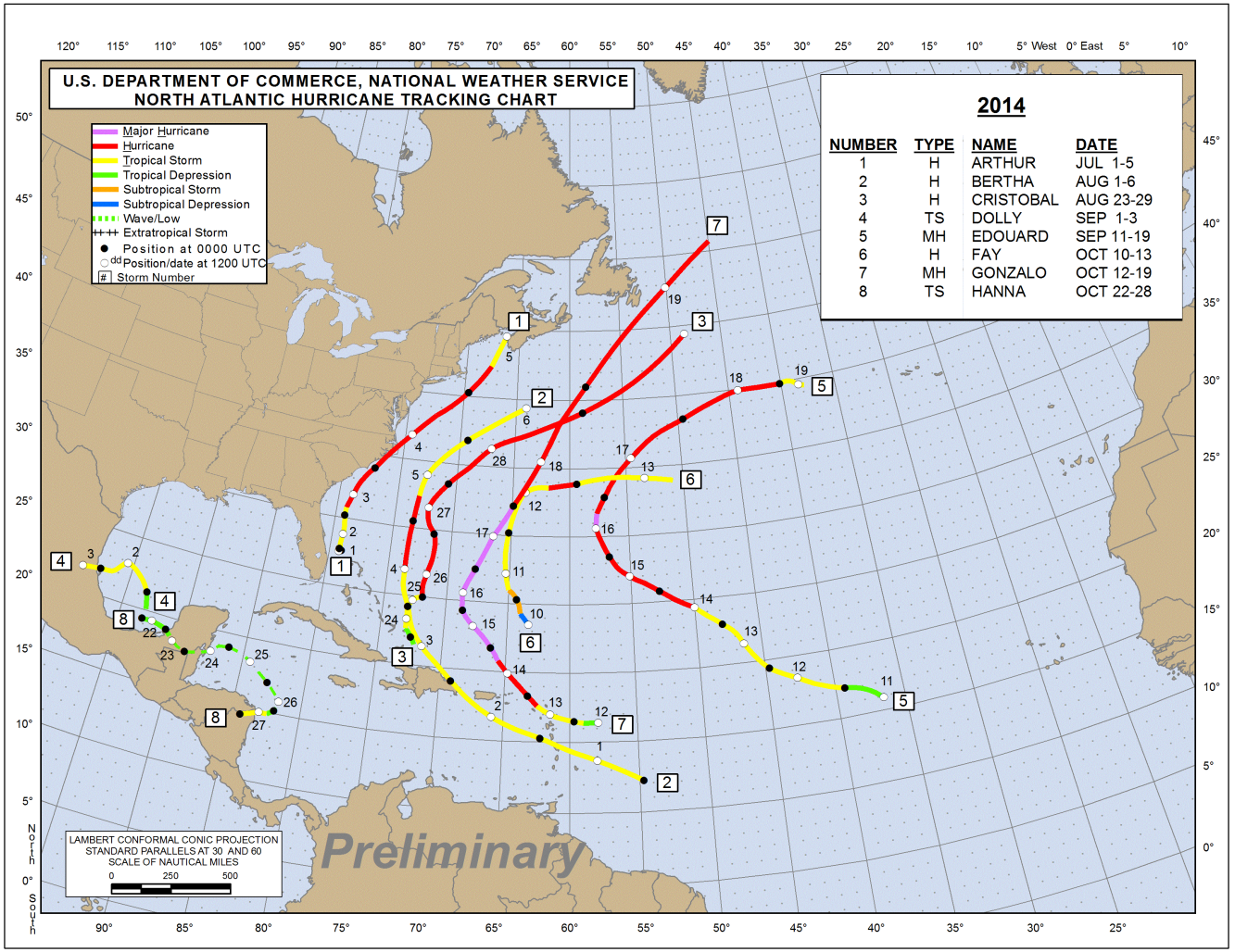
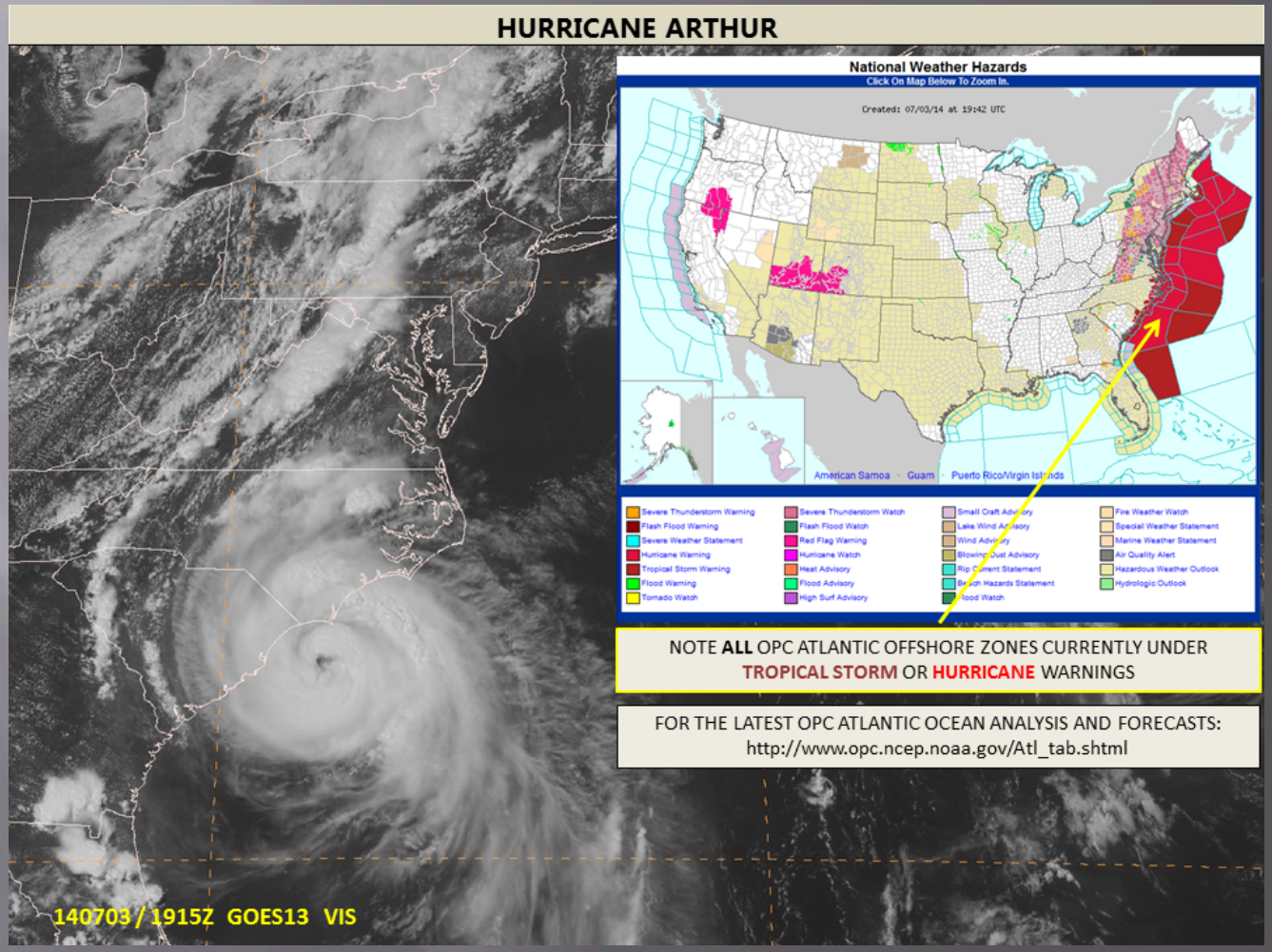
95th AMS Annual Meeting
01/05/15

2014 Atlantic Hurricane Season



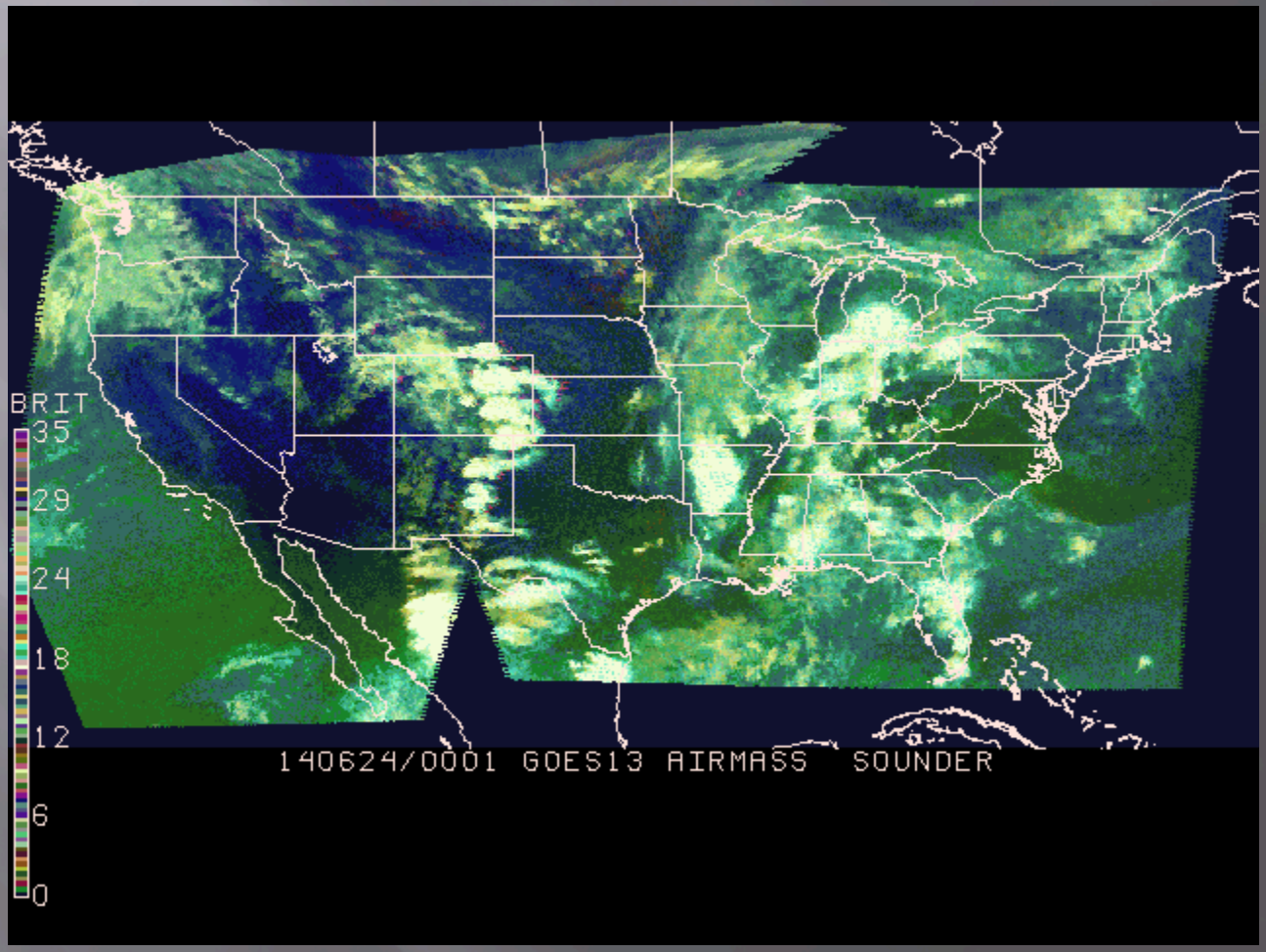
NWS Watches and Warnings as Arthur Moved up the East Coast



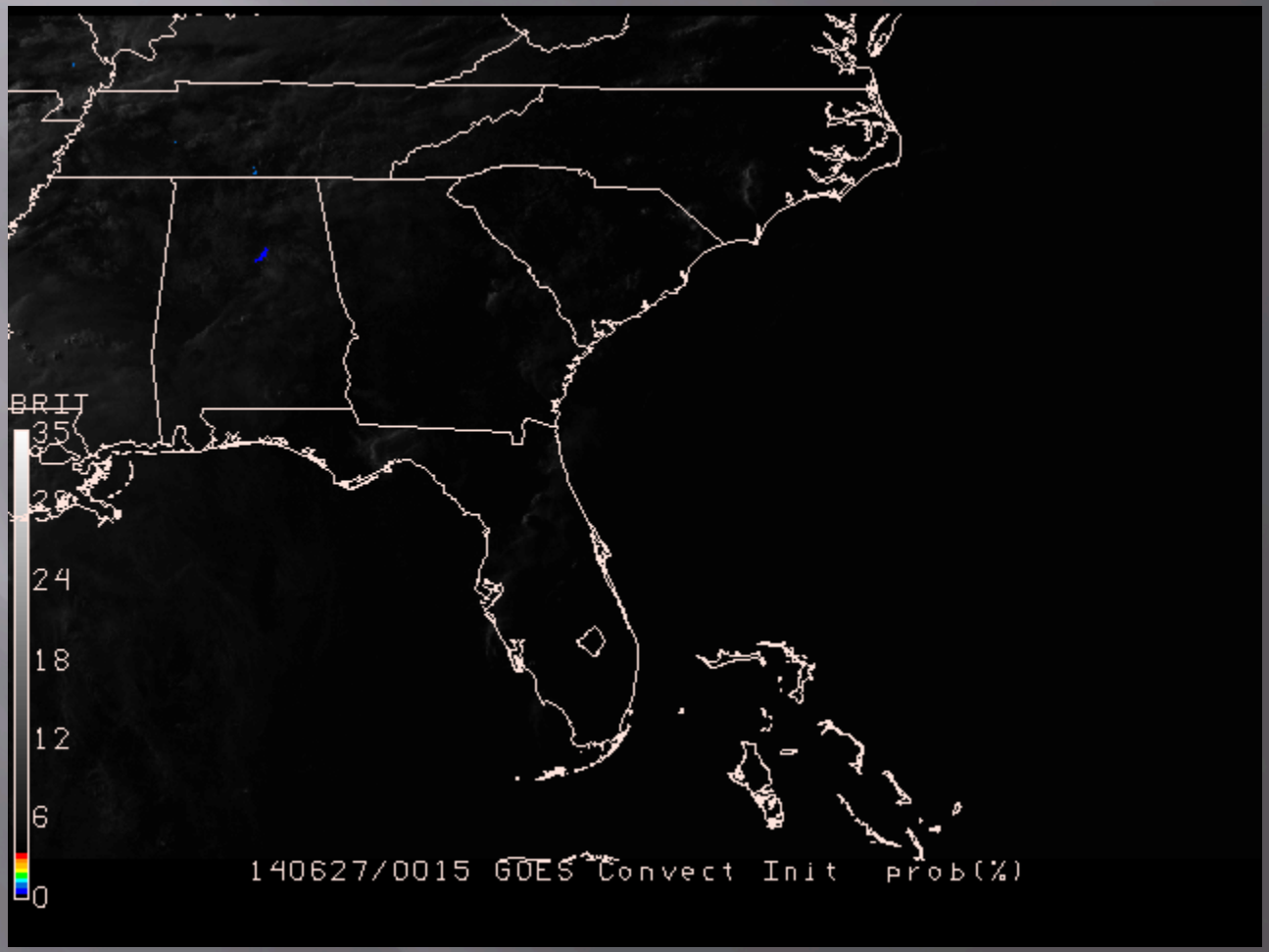
Hurricane Arthur's Lifecycle

- A cluster of thunderstorm in northeast NM moves southeast into the TX panhandle and forms an MCV.
- The MCV gradually moves east towards the SC coastline between 06/25/14 – 06/30/14.
- The MCV develops thunderstorms that remain sheared for ~48 hours while drifting south towards the northern Bahamas.
- Tropical Storm: 1500 UTC on 07/01/14
- Hurricane: 0900 UTC on 07/03/14
  - Landfall in NC at 0315 UTC on 07/04/14
- Transitions to an extratropical storm on 07/05/14, producing damage in Nova Scotia.

GOES-Sounder RGB Air Mass Hurricane Arthur's Lifecycle

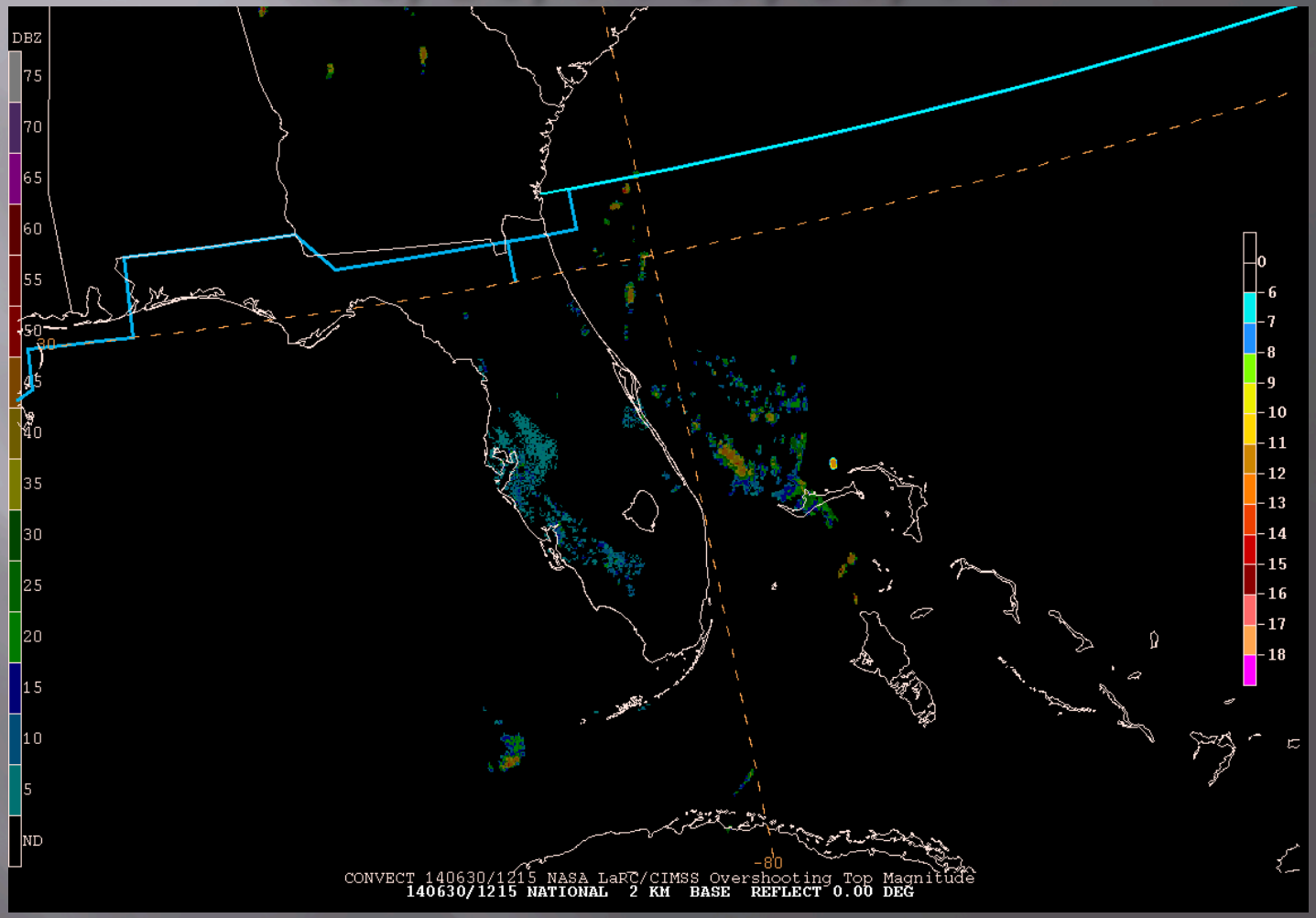


GOES-R Convective Initiation Arthur – Tropical Cyclone Stage



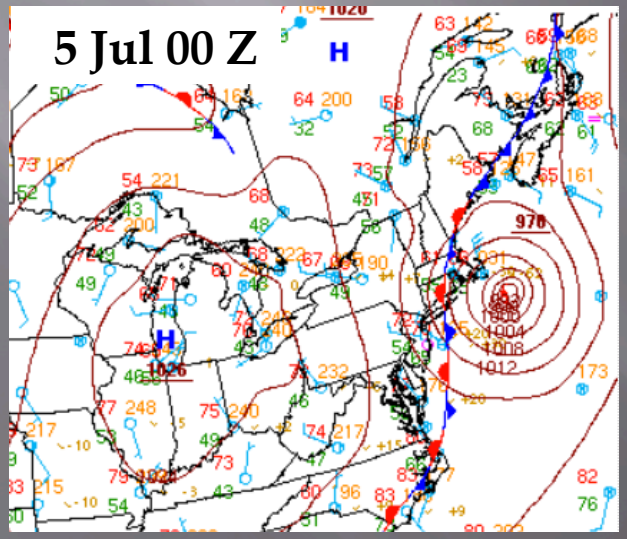
Overshooting Top Magnitude Overlaid on Radar

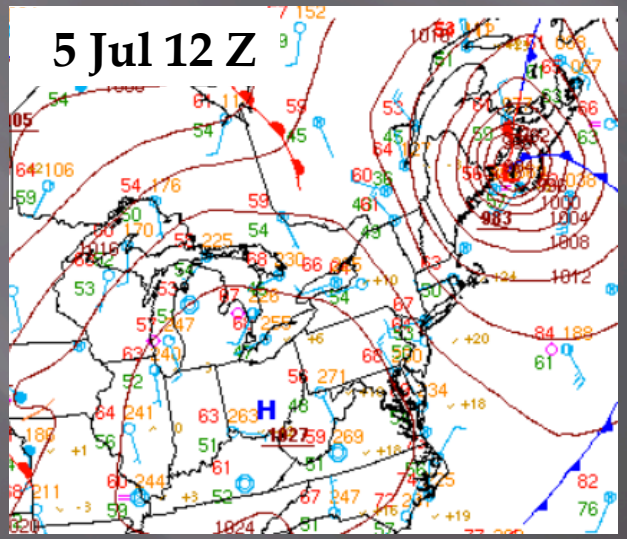
06/30/14-07/01/14

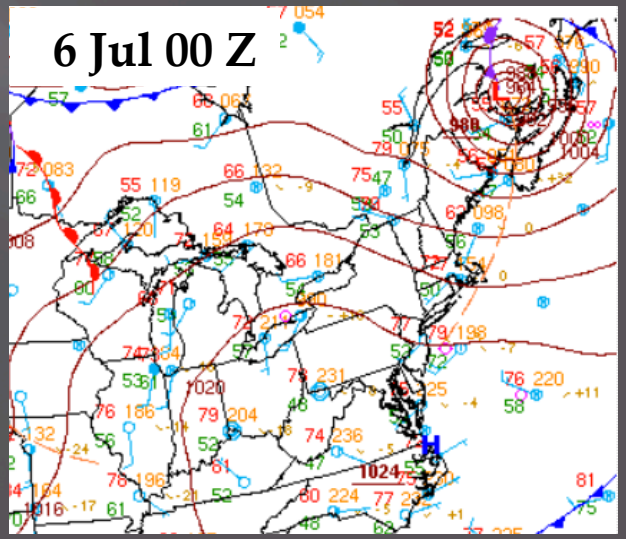


Extratropical Transition Phase & Devastating Wind Storm

- Arthur merged with a stationary (coastal) front early on July 5
- On July 5, MSLP rose from 976 mb at 00Z to 983 mb at 15 Z
- MSLP then *decreased* to 980 mb as post-tropical Arthur rejuvenated over Nova Scotia, through 00 Z July 6
- Widespread damaging wind event ensued across Atlantic Canada during the rejuvenation phase of ET
- Gusts over land were 65-80 mph with a peak official gust of 86 mph
- 300,000+ lost power, power grid demolished, took 10+ days to fully restore

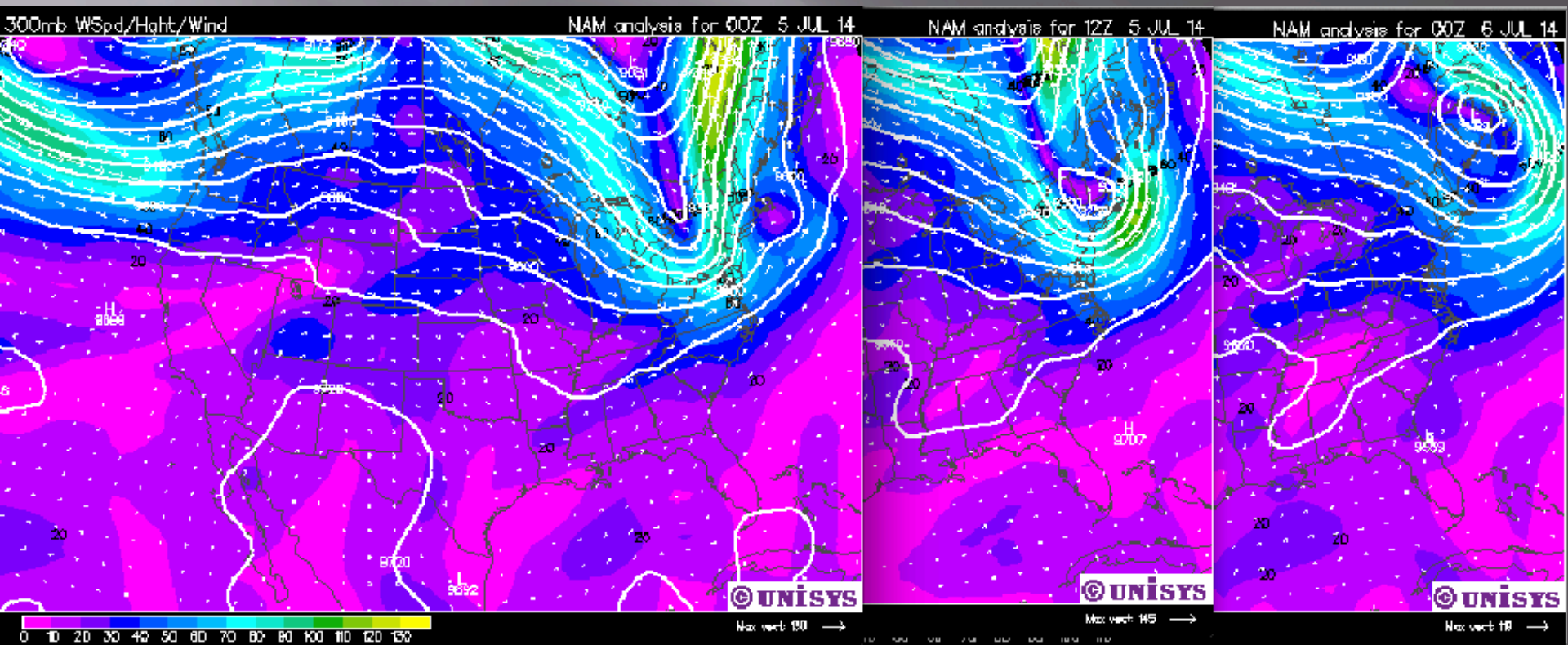






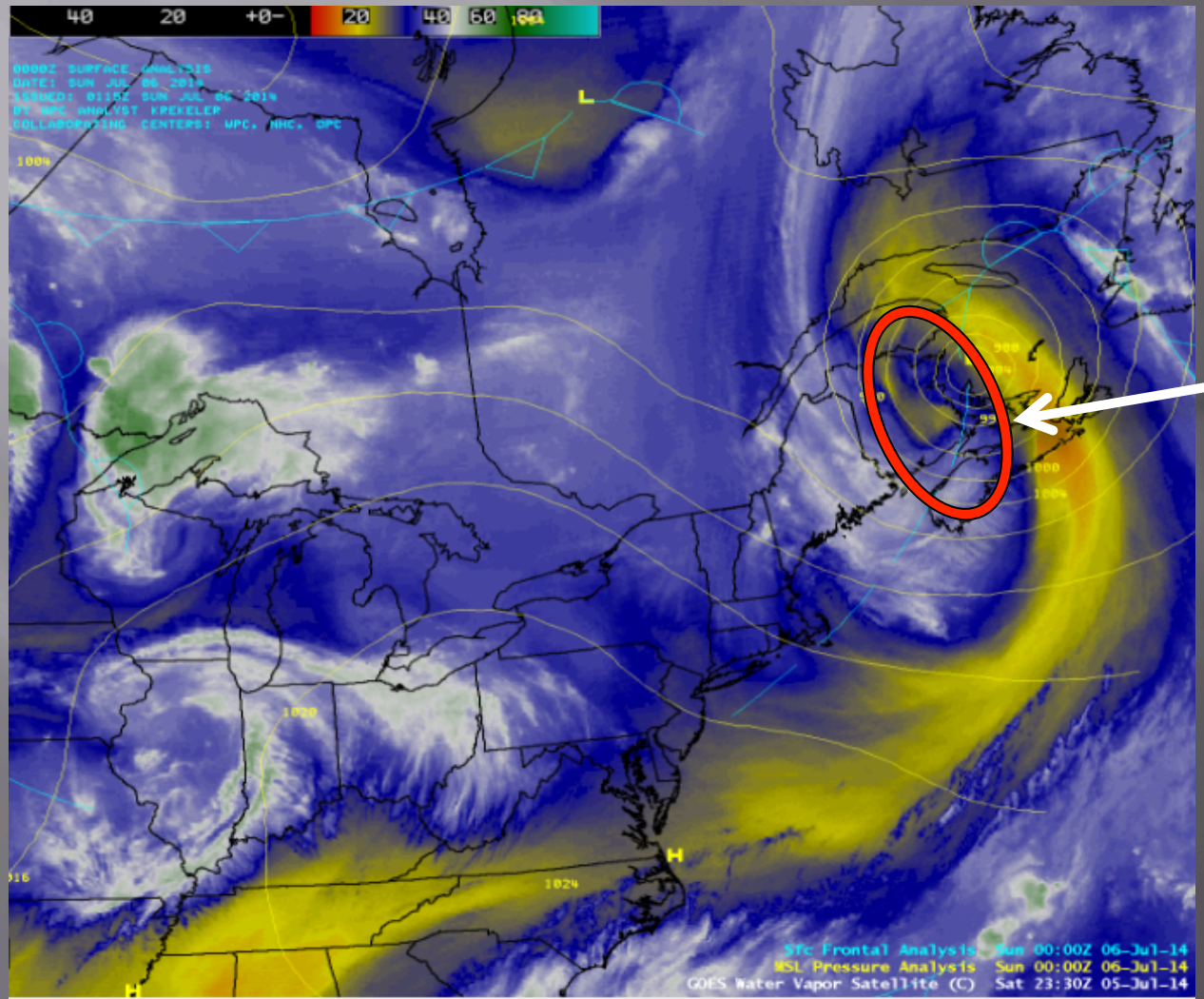
Jet Stream Interaction During ET

- Arthur's vortex interacted with an approaching high-amplitude, negative tilt trough in the westerlies
- The northwestern quadrant of the Arthur's circulation came under influence of the right entrance region of the trough's jet streak
- Favorable mesoscale ascent in this diffluent region may have led to rejuvenation of post-tropical Arthur
- Arthur's upper-level vortex phased with the westerly trough



Sting Jet During ET?

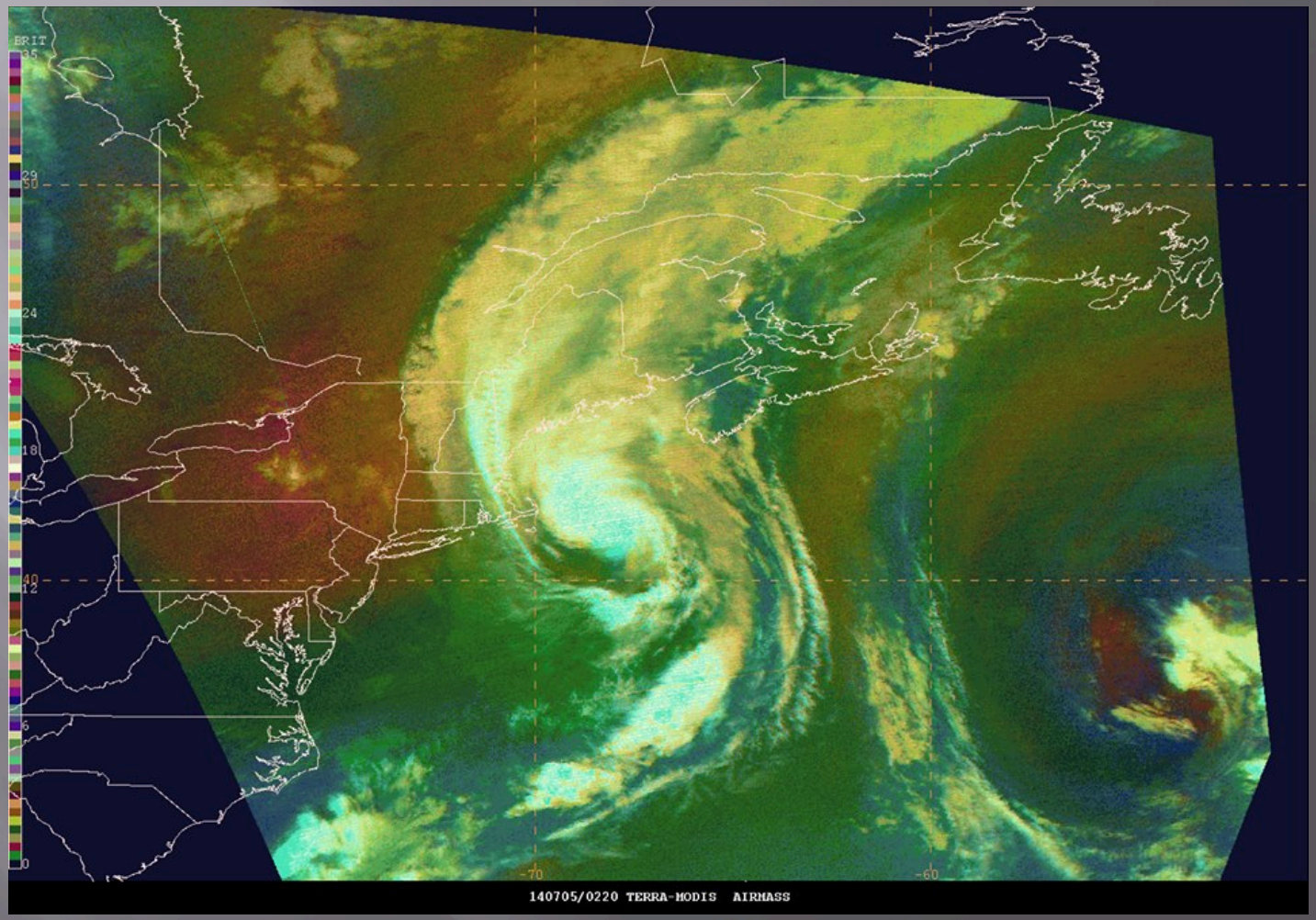
- Both the CMC and CIMSS stated that the region of damaging gradient wind over Atlantic Canada, left-of-track, was likely associated with a sting jet – which developed during rejuvenation phase of ET



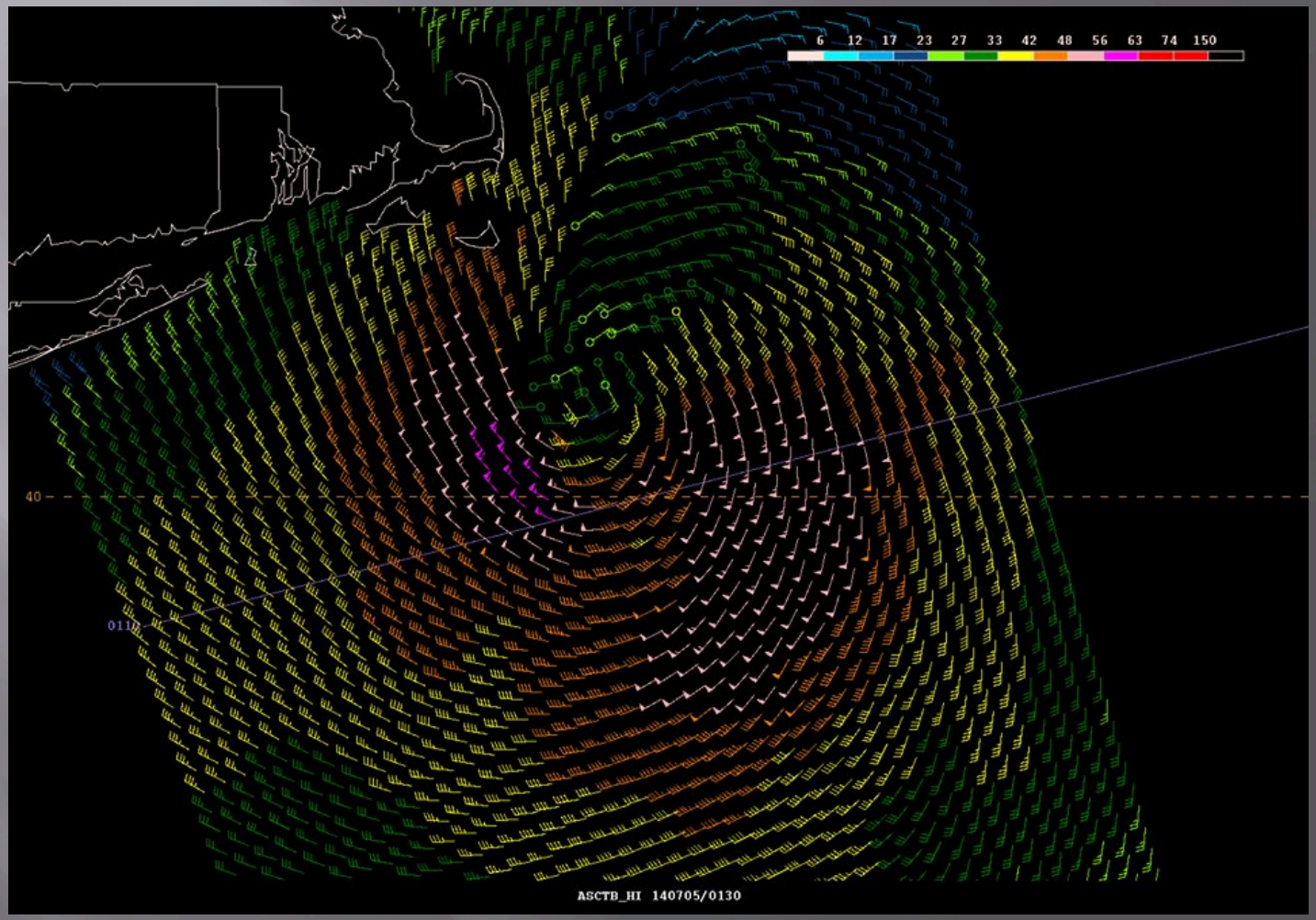
6.5 μ m water vapor image courtesy of CIMMS Blog

July 5, 2330 Z

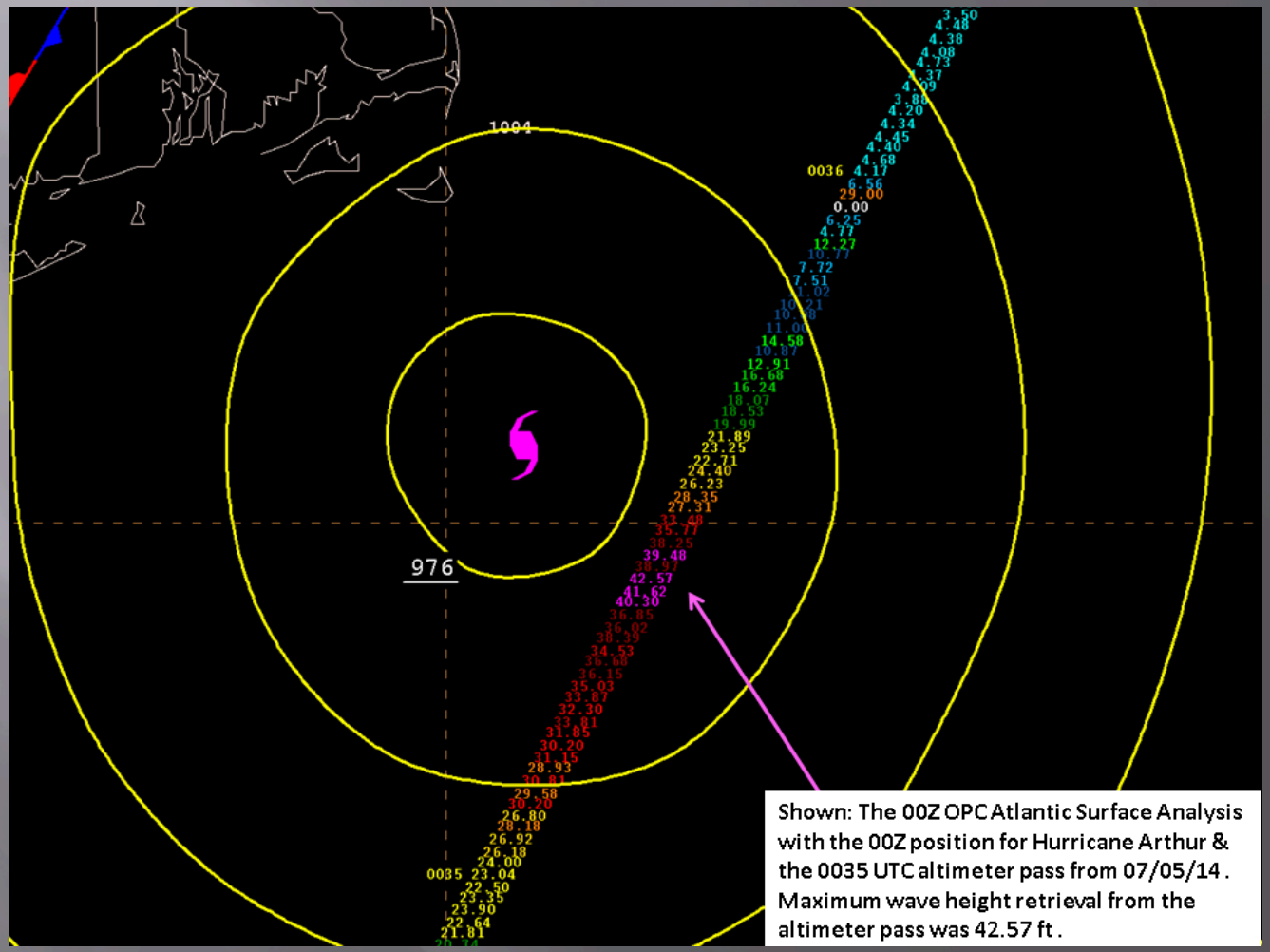
RGB Air Mass: Hurricane Phase on 07/05/14



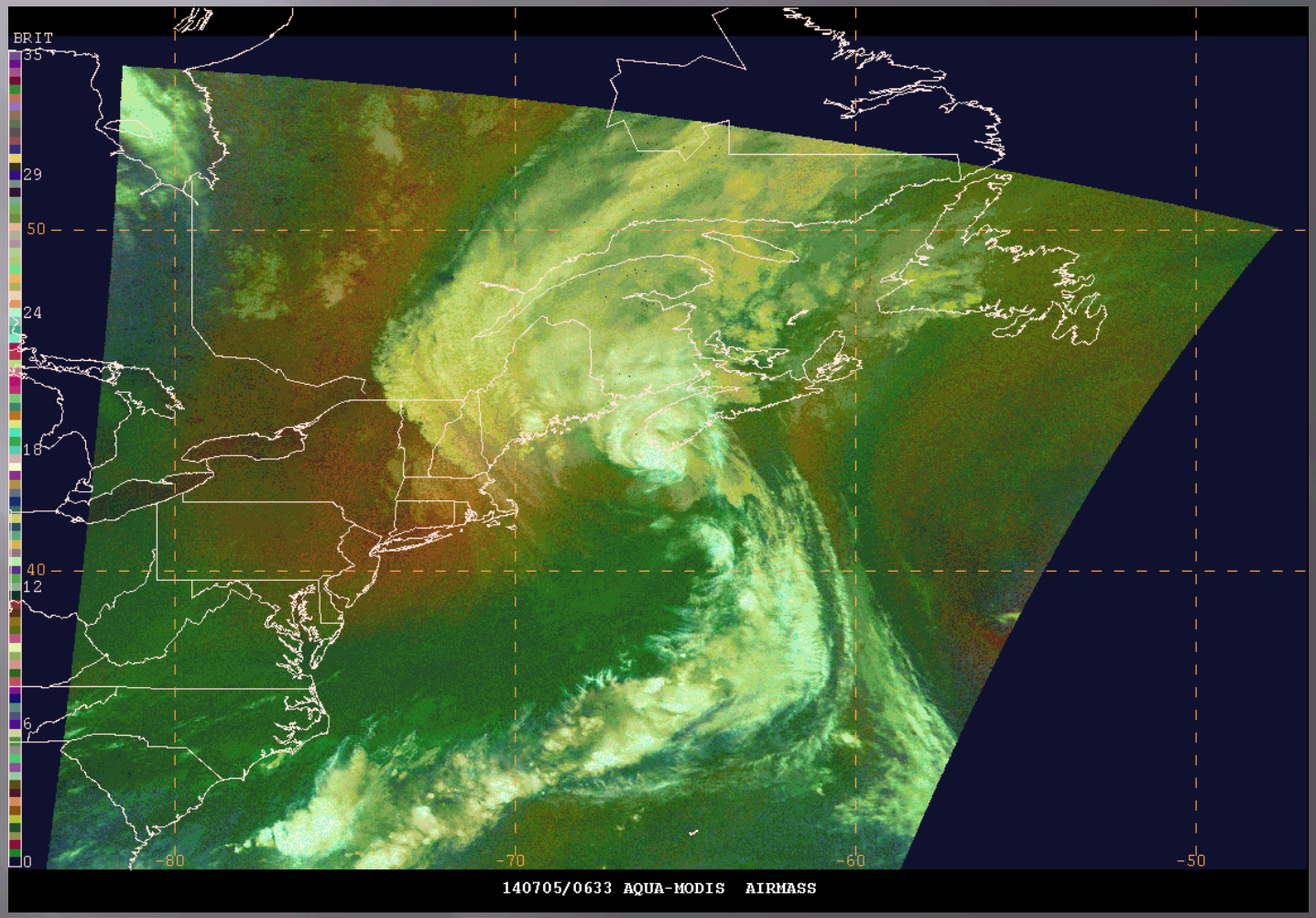
ASCAT Hi-Res Pass on 07/05/14



Jason-2 Altimetry Pass on 07/05/14

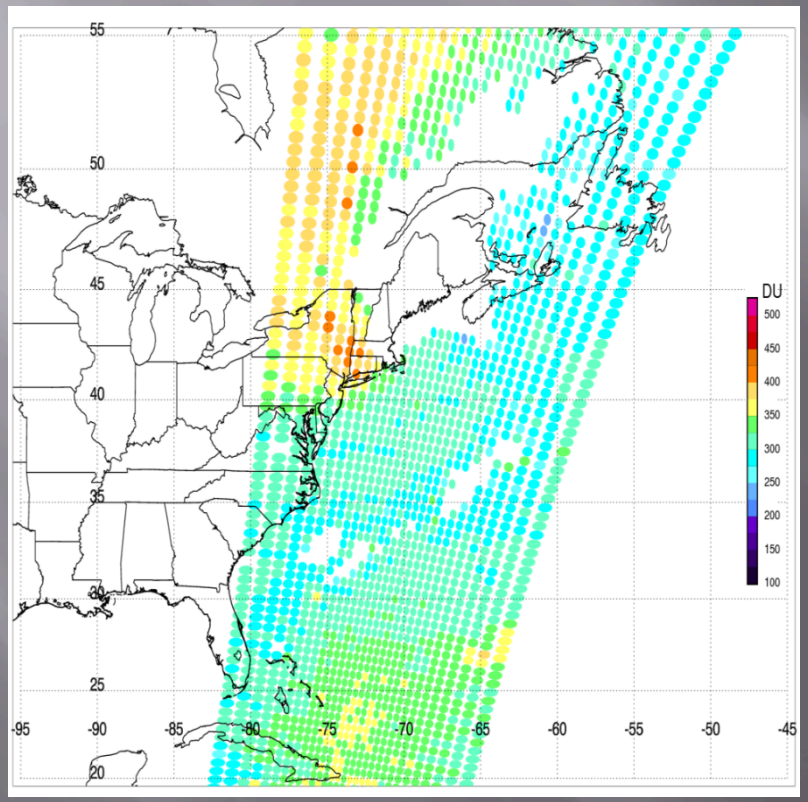


RGB Air Mass: Hurricane Phase on 07/05/14

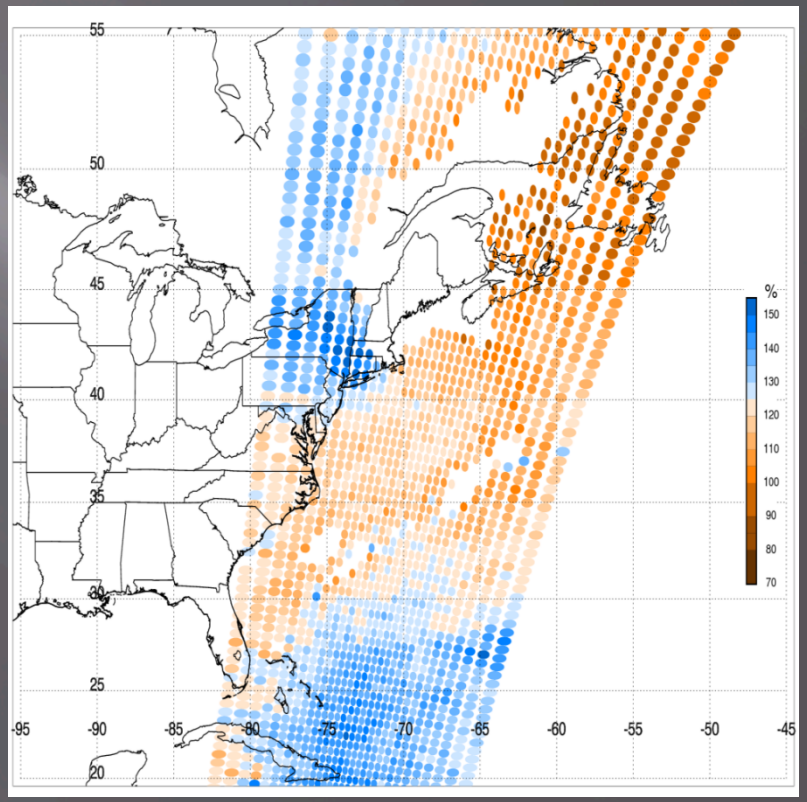


AIRS Ozone: Start of ET at 0600 UTC on 07/05/14

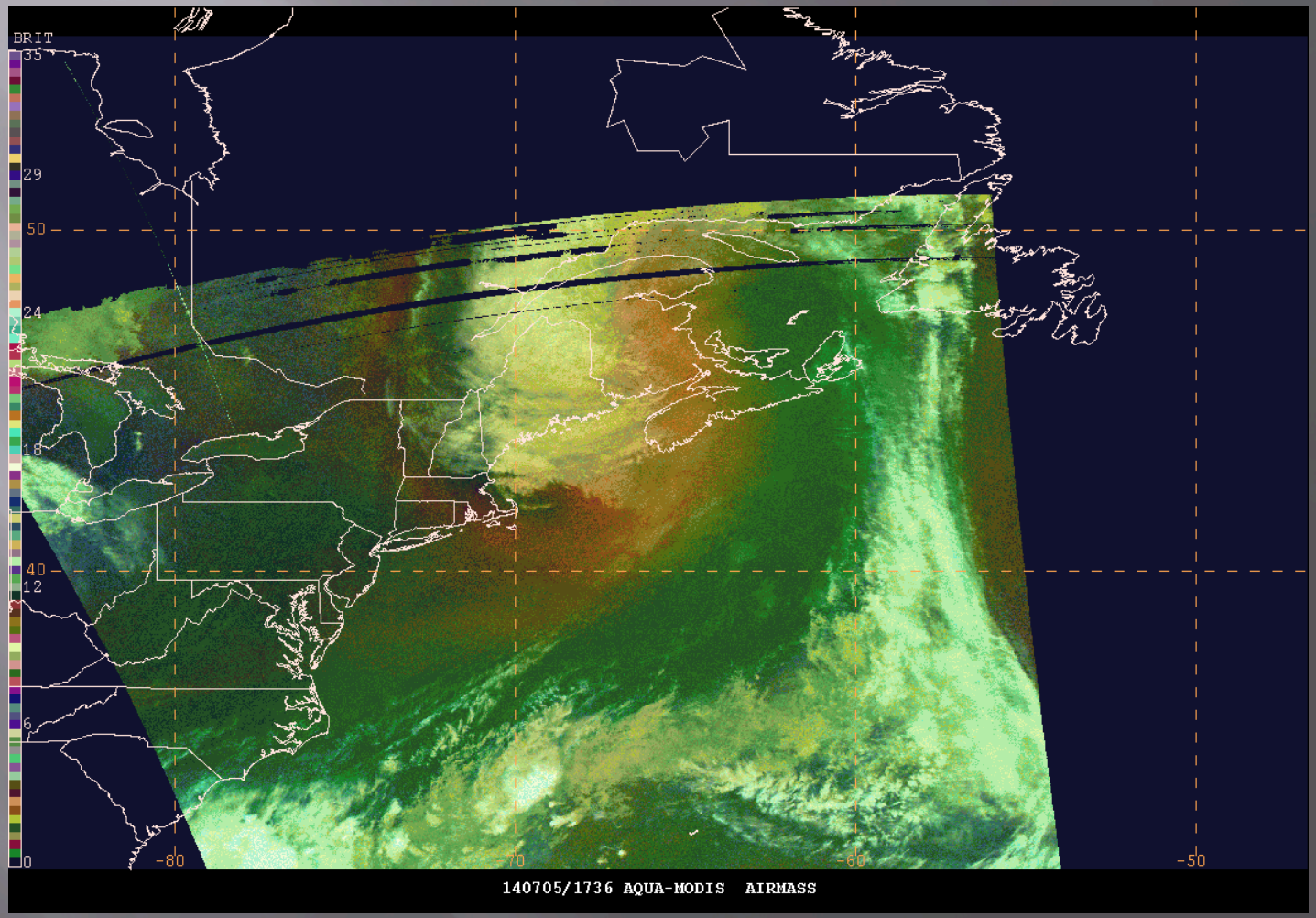
TOTAL COLUMN



ANOMALY

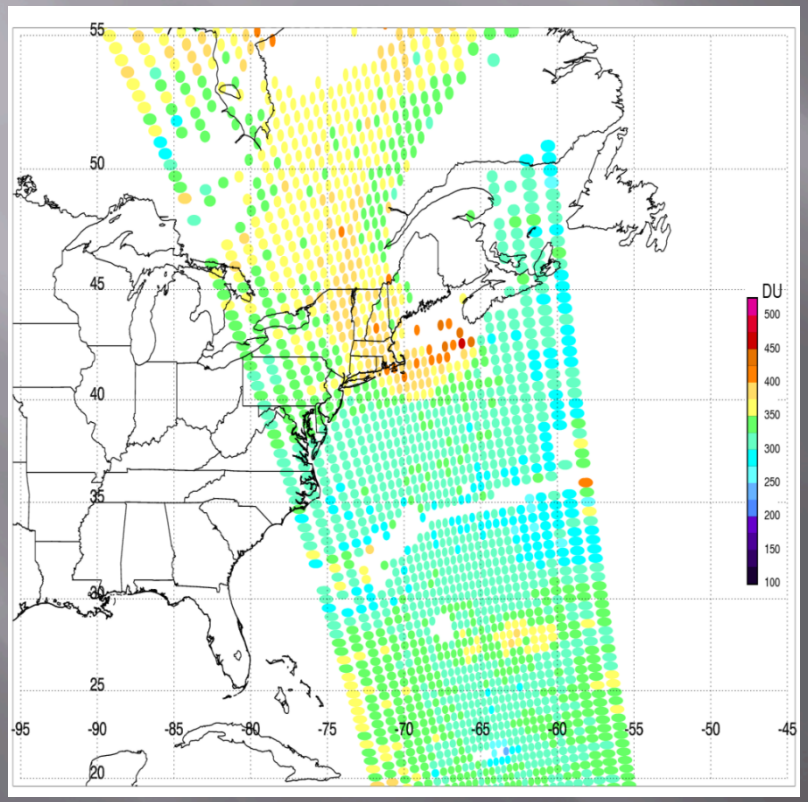


RGB Air Mass: Hurricane Phase on 07/05/14



AIRS Ozone: ET at 1700 UTC on 07/05/14

TOTAL COLUMN



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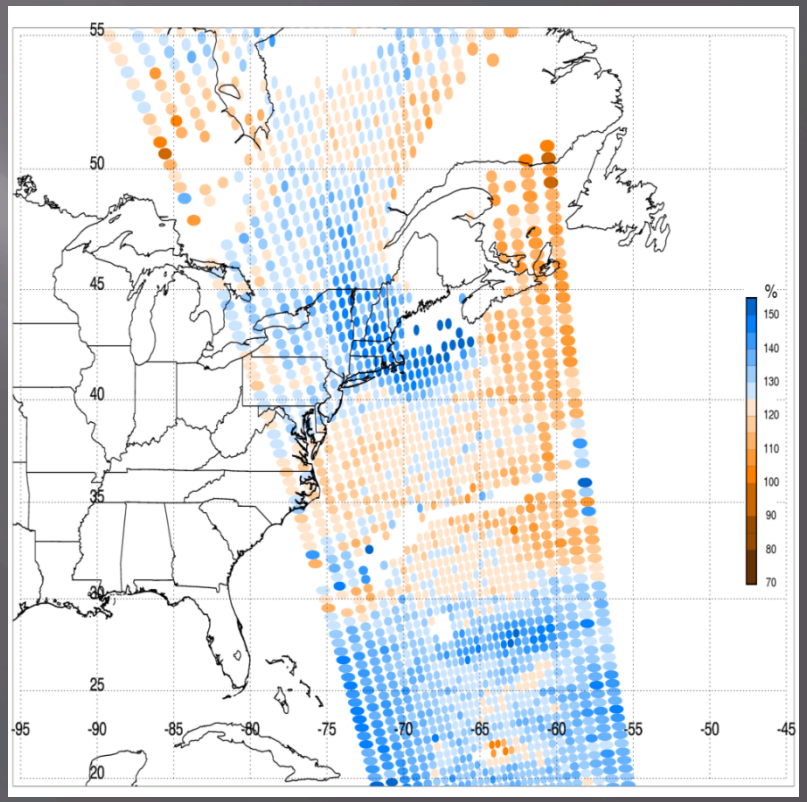

Summary

- Multiple satellite PG products were available to forecasters during Arthur's lifecycle and were occasionally used.
  - GOES-R Convective Initiation – MCV stage
  - Overshooting Top Detection/Magnitude – MCV/TC genesis stages
  - RGB Air Mass – Extratropical Transition stage
  - Ozone Product – Available, but unsure of use (more training needed)
- Arthur's extratropical transition was well-forecast and there were interesting features noted in the RGB Air Mass imagery that forecasters are learning to use during these transitions.
- More research needs to be done to quantify these PG products for extratropical transitions, including showcasing the usage with NWP and other observations to emphasize features of interest.